

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Corrosion of Stone and Brick

THE corrosion of iron and steel differs from the corrosion of ceramic materials and stone in that although there may be varying opinions as to the precise mechanism, there is no dispute as to the root cause. It has been stated authoritatively by Hudson in "The Corrosion of Iron and Steel" that "the most noxious by far of the atmospheric impurities is the sulphuric acid derived from the free discharge of the products of the combustion of coal into the atmosphere. Every chimney discharging smoke into the air is increasing the amount of rusting of the iron and steel exposed in its neighbourhood." It has always been assumed, almost as unnecessary of proof, that the same causes are operative in the decay of building stone. Considerable damage results in towns and other smoky areas, and since most of the building stones affected contain carbonates, what could be more obvious than that the formation of sulphates is the cause of building-stone decay. The disintegration of the stone is explained as due to the recrystallisation of calcium sulphate which dislodged weakened parts of the stones.

It must be confessed that the disintegrating effects of inorganic compounds upon clay materials are complex and the cause is often difficult of solution. In the earlier days of by-product coking, the claybound refractory materials composing the oven walls were often so seriously attacked by the coal that the walls had to be rebuilt at intervals of less than a year. In due course it was found that this happened only when the coal contained considerable amounts of sodium or potassium chlorides, and the phenomenon was termed "salt corrosion." Twenty-five years ago and more, papers were read in which the mechanism of this reaction was explained with great assurance; but to this day no satisfactory explanation has been given, and the British Refractories Research Association is to-day engaged upon work on this very problem. It is not even certain yet whether the sodium or the chlorine is the destructive agent.

Amidst the chorus of condemnation of sulphur, Mr. Thomas McLachlan has raised a lone voice insisting that the decay of building stone is due not to the sulphurous products of combustion but to organic agencies. He has noted that building stones, both decayed and fresh, have algæ or fungi growing upon them. These algæ live upon food which is plentiful in towns, and may often be sulphurous in character. The destructive effect of organic growth is too well known to need proof. If this theory is correct, the product of the decay would not be calcium sulphate

but calcium carbonate, and one objection, *inter alia*, that has been raised against Mr. McLachlan's contention is that there is insufficient evidence to show that the primary product is, in fact, carbonate. He has endeavoured to meet this objection in a paper recently published in the Transactions of the Society of Chemical Industry.

Mr. McLachlan shows that in a great number of instances the weathered product contains less sulphur than the sound stone, and that neither in the sound stone nor in the weathered crumbly product is there more than perhaps 0.1 to 2.5 per cent. of sulphur expressed as SO_3 . The sulphates, he points out, form a skin on the surface, to which he ascribes a protective effect. He also points out that when oölitic limestone decays there is no evidence of the growth of calcium sulphate crystals in the interior of the oöliths, but that nevertheless the oöliths are attacked from within. Why, he asks, should inorganic acids fail to attack the exterior and pass into the interior before exerting their destructive effect? Oöliths are at times attacked on the outside and the separate oöliths detached from each other. This, of course, might be interpreted as being due to acid attack, and the suggestion might be made that the decay of stonework may be due to more than one influence: algæ and fungi growth and the action of sulphur acids. Mr. McLachlan evidently disagrees with this, for he points out that the specific gravity of calcium sulphate is such that "the decaying material would have to contain 52 per cent. of calcium sulphate before the pore space is completely filled." This portion of his argument strikes one as being weak; why should it be necessary for the pore space to be filled before disruptive influences begin to work? A single formation of crystals could cause a flake of stone to be dislodged without any necessity for the filling of the pores. On the other hand, Mr. McLachlan shows that there is no connection between the proportion of sulphur or sulphates present in a stone and the extent of the decay. Whether one would or would not expect such a correlation is uncertain. May it not be that the sulphurous acids are washed into the interior of the stone, and that they are enabled to get there because a certain time is necessary for their reaction with the stone. A crystallisation of calcium sulphate could then occur along a plane which would have a disruptive effect. That, at least appears to be the mechanism of "salt corrosion." Mr. McLachlan may not have proved his theory, but he has done enough to receive the serious consideration of the scientific world.

NOTES AND COMMENTS

The "C.A." and the Blitzkrieg

NOW that London has continued to be the principal objective of the "Blitzkrieg" for the best part of a month, and news of local transport and other difficulties has permeated the world, we imagine that our readers will hardly need any explanation of delays which may have occurred in the distribution of *THE CHEMICAL AGE*. What are euphemistically termed circumstances beyond our control have affected communications, and more particularly the postal services. But they have not affected the continuous publication of this journal, and seeing how severe the crisis has been, that is a matter of great pride to the publishers. The ruthless warfare undertaken by a barbarous enemy has not only drawn more closely together all classes in this country, but it has given each individual a new conception of patience and forbearance. Every one of us knows from his own experience at home, or in business, that nothing is normal, and that generous allowance must be made for even drastic variations from the routine of peace time. Newspapers, like every other branch of national service, cannot escape their ups and downs in time of war. But of one thing, however, our readers can be absolutely certain. It is that *THE CHEMICAL AGE* has kept the flag flying, is keeping it flying and will keep it flying no matter what befalls.

Exemptions from Purchase Tax

THE Commissioners of Customs and Excise have issued Public Notice No. 78, listing the classes of goods chargeable with purchase tax, together with the corresponding statutory exemptions. Industrial chemists will be interested principally in Class 19 (Drugs and Medicines). Here the statutory exemptions from the tax comprise a very long list—too long to publish here—which appears to include every industrial chemical in ordinary use. All the materials in the list "when not put up for medicinal, veterinary, or toilet use," are entirely exempt from the 16½ per cent. purchase tax chargeable on Drugs and Medicines. A copy of the list will be kept in *THE CHEMICAL AGE* office, and any of our readers who are in doubt as to whether a commodity with which they are concerned is or is not liable to be taxed, have only to apply to us, and we shall be glad to let them have the fullest information possible.

Training Skilled Workers

THE problem of training skilled employees is extremely urgent, equally so is the rapid training of semi-skilled, unskilled workers and women. A pamphlet just published by the National Institute of Industrial Psychology, price 3d., entitled "Training Industrial Workers," describes training methods based on scientific investigation, and capable of immediate use by firms faced with these problems. It shows the drawbacks of leaving learners to pick up the work by themselves, or merely by watching experienced workers. In the description and illustration of better methods industrial training is divided into two main sections: (1) instruction in the knowledge necessary for the job, including mechanical processes, technical terms, etc.; and (2) instruction in correct, quick and easy movement. Training under the first head is best carried out away from the shops. The amount necessary varies with the job, and it is shown how quite simple movement study principles can be used with immediate results. Emphasis

is laid on the choice of an instructor, who should be taken off productive work while actually engaged on teaching. Examples are given of the excellent results that have been obtained by the use of these methods. In a munitions factory, for instance, in one department the manufacture of air-tight shell fuse cases demanded a large amount of very careful hand soldering of seams. It proved difficult both to obtain and to keep experienced solderers, and, in the early stages, the weekly output of the department was only 10,000 good cases per week. However, the Works Director decided to instal a systematic training scheme, and to initiate certain other changes. These measures collectively caused the number of rejects to decline and the output of goods cases gradually to rise until, after several months, it was 20,000 a week. Obviously this result could not be attributed solely to systematic training, but those concerned are agreed that the training school has played a major part in the department's rapid progress. The advantages of the application of these principles to the manufacturing processes of industrial chemistry are self-evident.

I.G. Annual Report

THE I. G. Farbenindustrie A.G., of Frankfurt-on-Main, has issued balance sheets and accounts for 1939. As in the case of most other German firms, the accounts show a large increase in turnover as compared with 1938, and a greater allocation for taxation, so that dividends and net profits remain unchanged. Trading income showed a further substantial increase to *Rm.* 786,000,000, compared with *Rm.* 667,000,000 in 1938. Wages, etc., took *Rm.* 364,360,000, against *Rm.* 341,400,000, while *Rm.* 171,240,000, against *Rm.* 135,720,000, was written off for depreciation of plant. Taxes increased to *Rm.* 171,450,000, against *Rm.* 125,000,000. Net profits in 1939 totalled *Rm.* 56,070,000, against *Rm.* 55,180,000, the whole of these being devoted to paying unchanged dividends of 5 per cent. on preferred, and 8 per cent. on ordinary shares. The trading report attached to the financial statement states that owing to the war there has been a diversion of trade to neutral and mainly European countries, but that turnover in all sections has increased to record levels. The company has acquired a number of new subsidiaries, and introduced several new products, including Pe Ce, a synthetic fibre made from coal, to the market. No information is given as to the tonnage of products produced or sold. The Gelsenberg-Benzin A.G., the hydrogenation subsidiary of the Vereinigte Stahlwerke A.G., has doubled its capital to *Rm.* 100,000,000, and at the same time raised a loan of *Rm.* 75,000,000 to finance developments.

OUR VICTORY CELEBRATIONS

When the day comes—not, surely, far distant—for *THE CHEMICAL AGE* to join in the national victory celebrations we shall hope to tell the full story of the glorious part played by the chemical and chemical engineering industry in the Battle for Britain. For reasons which we all appreciate and respect it is not expedient to collect such information at the present moment; but we do appeal to firms in the trade—and, indeed, all our readers—many of whom have played a heroic part and will be able to claim their full share in the Victory rejoicings, to keep their diaries up to date, so that where the information cannot be sent to us now they may be in a position at the appropriate time to supply us with photographs, details and particulars which the rest of the industry would be very glad indeed to see and honour.

FLASH-ROASTING OF SULPHIDES

Progress in Canada

by D. D. HOWAT, B.Sc., A.Inst.M.M., Ph.D.

OLEUM (fuming sulphuric acid), which constitutes the keystone of the arch of the high-explosive industry, is one of the most important war materials, the sulphur dioxide required for its manufacture being obtained from sulphur or iron pyrites. Not the least of the problems facing explosive manufacturers in Great Britain at the present time is to obtain sufficient supplies of these two minerals to meet the steadily increasing demand for oleum.

The sulphur content of the combined imports of brimstone and pyrites into this country in a normal year is about 200,000 tons. Of this total nearly two-fifths was obtained from Spain, smaller supplies coming from Norway, Italy and Cyprus. So, with the exception of about 100,000 tons of brimstone imported from the U.S.A., all the European supplies are either cut off or seriously imperilled by the war situation on the Continent. Supplies of these two vital war materials must be maintained and in view of utilising to the utmost those which are available the following outlines of the new process of "flash roasting" sulphides should be of interest. At a Canadian paper mill, where the method was devised, it is applied to the production of sulphur dioxide from pyrite. An extension of the method to the treatment of zinc sulphide concentrates was developed at Trail, B.C., where the sulphur dioxide produced is used both for acid manufacture and in the production of elementary sulphur.

For many years serious disadvantages attended the roasting of sulphide ores in multi-hearth furnaces:—First, the necessity of converting the sulphur dioxide into sulphuric acid; second, the dust losses; and third, the supply of external heat to effect the elimination of all the sulphur from the calcine. Very extensive research work was carried out and a number of improvements made. With the older methods it was difficult to prepare acid from the dust-laden gases containing only 2 to 4 per cent. sulphur dioxide, but now roaster gases, carrying up to 12 per cent. sulphur dioxide, may easily be rendered dust-free by Cottrell or other precipitators and rapidly converted into acid.

The years 1900 to 1920 witnessed a great expansion in the newsprint industry in Canada. In the installations erected during that period sulphurous acid was produced by the burning of sulphur, in the form of brimstone, in rotary burners and the subsequent cooling of the gases in lead-pipe coils. During the past fifteen years, however, the expansion of the base-metal industry in Canada has rendered available large quantities of pyrite as a by-product. A feature of great metallurgical interest within the past few years, has been the development of "flash-roasting" of this pyrite, which is used as a source of sulphur dioxide for the preparation of sulphurous acid—the "cooking acid" so extensively employed in the manufacture of newsprint.

Pyrite Substituted for Brimstone

There were a number of factors favouring the use of pyrites as a substitute for brimstone. Pyrite concentrate, prepared by froth-flotation, was available in a more or less standardised form, finely ground and containing 48 to 51 per cent. sulphur in the dried state, but brimstone had to be imported. As the heat value of pyrite was 3000 B.Th.U. per lb., twice as much heat was generated in producing a given volume of sulphur dioxide as when brimstone was used, so opening up the possibility that some, at least, of this surplus heat could be used for power generation. Although two tons of pyrite was required to equal one ton of brimstone as a source of sulphur, nevertheless in any given space 15 per cent. more sulphur could be stored as pyrite than as brimstone.

A first step towards the substitution of pyrite involved the determination of the efficiency of the conversion. Investiga-

tion showed that the efficiency of the conversion of sulphur in brimstone to sulphur in acid averaged only about 88 per cent. The slow-cooling of the gases from the burners from 1000° C. to 400° C. aggravated the formation of sulphur trioxide, causing one of the chief losses. In the oxidation of pyrite the same high temperatures (1000° C.) would be maintained, but a strongly catalytic effect in the sulphur dioxide to sulphur trioxide transformation would be exerted by the large quantities of iron oxide particles produced in intimate contact with the gases. It was therefore obvious that it would be necessary to cool the gases very rapidly

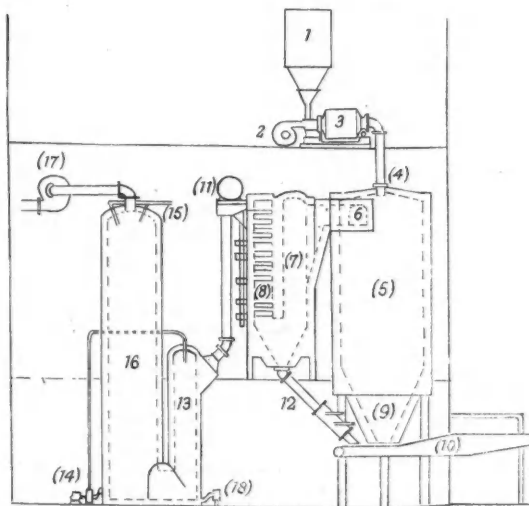


Fig. 1. Plant used in Flash-Roasting Pyrite in Canada.

from 1000° C. to 400° C., and that the lead-pipe coolers, previously so extensively used, would be quite unsuitable. It was later shown that the sensible heat in the gases is such that a steam-generator may profitably be employed in preference to a water-scrubber or wash-tower.

In a series of papers, Mr. H. Freeman, technical director of the Consolidated Paper Corporation, has indicated the progress of his investigations in the flash-roasting of pyrite to yield sulphur dioxide for the manufacture of sulphurous acid.

The first attempts were made at Shawinigan Falls in 1927, a horizontal chamber heated by an electric arc being used. The arc was extended into the furnace by a blast of air, which also formed the means of introducing the solid material. Zinc sulphide concentrate was first tried out in the process and it was soon discovered that the heat generated after ignition of the sulphide was sufficient to maintain combustion without the heat of the arc. Pyrite was found to yield better results than zincblende and the first large-scale installation was set up at the St. Maurice mill, this being later superseded by the present plant.

The improved unit now in use is shown in the accompanying line drawing (Fig. 1). The concentrates are bought with a maximum moisture content of 2 per cent. and the drying is accomplished at the mine by flue gases in a rotary drier, with concurrent flow of gases and solids. The dried product is handled in hopper-bottomed cars which discharge into the feed-hopper (1). A star-feeder with an adjustable ratchet controls the feed from the hopper (1), the product being delivered by the current from the primary air-fan (2) to a lightly-loaded ball mill (3), in which any aggregate are broken up and a suspension of material in air effected. A

suitable air-supply, furnished by the primary air-fan (2) driven by a variable-speed motor, blows the material through the burners (4) into the combustion chamber (5). This cylindrical chamber, formed by a steel casing with a lining of ordinary firebrick backed by silocel, is fitted at the top with two outlets (6), by which the waste gases are conveyed to the dust chamber (7) and the waste-heat boiler (8). In the bottom of the combustion chamber is a receiving hopper (9), through which the oxide discharges to a pan-conveyor (10). Entering the waste-heat boiler (8) at a temperature of about 1000°C ., the waste gases from the furnace, which carry about 11 per cent. sulphur dioxide, are discharged at about 350°C . through mild steel ducts (11) to the cooling and washing towers (13 and 16).

The waste-heat boiler tubes are small and the velocity of the waste-gases so high that rapid cooling and a degree of self-scouring of the tubes is effected. If the unit is operated intermittently, or even with the ordinary shut-downs at week-ends, the steel boiler-tubes tend to corrode. To guard against this danger the tubes are now encased in cast-iron sleeves, equipped with fins, a modification which eliminates the corrosion and increases the cooling effect on the gases. The tubes are cleaned with a hand air-lance once per week, the dust falling down a chute (12) on to the same conveyor (10) that removes the oxide from the combustion chamber.

Some Difficulties

Two difficulties may be experienced in the combustion chamber. Firstly, the iron oxide produced is liable to slag with the fire-brick lining, leading to the formation of accretions which may grow rapidly and eventually choke the furnace. Insufficient removal of sulphur from the pyrite is the main cause of the trouble and may arise from bad burner design, insufficient air supply, improper mixing or insufficient combustion space. Secondly, temperatures considerably in excess of the optimum of 1100°C . were liable to develop in the combustion chamber and it was found necessary to bleed off part of the cooled gas from the boiler exit and recirculate it through the ball mill to the burners. To give accurate control of the temperature a pyrometer is inserted in the second pass of the boiler tubes, the amount of gas recirculated being controlled to maintain the temperature at this point about 750°C . to 850°C .

From the boiler the gases pass to a double-tower cooling system. In the first and smaller cooling tower (13) the wash-water is kept in continuous circulation by a Dur-iron pump (14), so ensuring that the final discharge water is maintained at the highest possible temperature and the loss of dissolved sulphur dioxide thereby reduced to a minimum. The incoming cold water (15), supplied at the top of the second and larger tower (16) cools the gases as they rise through the spiral tile packing. From this second tower the gases are extracted by a variable-speed fan (17) and pumped into the usual limestone absorption towers.

Of the total solid material burned about 60 per cent. is deposited in the bottom of the combustion chamber and the remaining 40 per cent. is carried over by the escaping gases. Half of this gas-borne solid is deposited in the dust chamber and boiler and returned to the calcine conveyor (10), while the remaining 20 per cent. is extracted by the wash-towers, the effluent from which discharges to a sewer (18).

A typical analysis of the pyrite used is as follows:—

Sulphur	...	...	...	50.00 per cent.
Iron	...	...	...	44.00 per cent.
Silica	...	...	...	2.00 per cent.
Arsenic	...	...	...	0.08 per cent.
Zinc	...	...	...	0.20 per cent.

The calcine, in the form of fused hollow particles of magnetite, contains up to 65 per cent. of iron and 0.2 to 0.5 per cent. of sulphur. The arsenic in gas entering the scrubbers has been found at 0.52 mgm. per cu. ft. and in gas leaving the scrubber at 0.022 mgm. per cu. ft.

The efficiency of conversion from sulphur in pyrite to sulphur in acid suitable for "cooking" is usually over 94 per

cent., the loss in the scrubber exit water being 0.9 to 1.8 per cent. of the total sulphur input. Steam is developed at 160 lb. pressure in a boiler of 125 h.p. capacity and when the unit is in normal operation about 24 short tons of pyrite are burned daily, the amount of steam produced being 35 to 40 tons. In an average monthly period 1.4 lb. of steam were produced per pound of pyrite burned. In the production of sulphur dioxide for oleum manufacture the method would appear to be particularly suitable if lower-grade or crude pyrites must be used, more especially where the mineral is associated with easily fusible materials, the presence of which may cause serious slagging and sticking in the ordinary multi-hearth roaster.

Roasting Sulphides

Although in the initial experiments at Shawinigan Falls the use of zinc sulphide concentrates did not prove highly successful, the development of the process with the adoption of pyrite seemed to indicate that, with some small modifications, roasting of other base-metal sulphides should be readily possible. The heat value of a number of these base-metal sulphides is lower than pyrite, high-grade zinc sulphide concentrate containing 51 per cent. zinc, 11 per cent. iron, but only 32 to 33 per cent. sulphur in contrast with the 48 to 51 per cent. in pyrite. It has recently been shown, however, that the process may be applied with the same measure of success in the treatment of zinc sulphide concentrates.

Roasting zinc sulphide to oxide as a preparatory stage in the extraction of the metal has always been attended with difficulties. When the metal is recovered by distillation in retorts, it is essential that the sulphur content of the charge should be as low as possible and when the old type of multi-hearth roasters were employed, considerable fuel was burned to reduce the sulphur to the desired low value. Even greater difficulties were experienced in roasting zinc concentrates for the electrolytic extraction process. Almost every electrolytic plant operates on the "low-acid" system, in which the calcine is leached with 10 per cent. sulphuric acid solution. Now any zinc ferrite ($\text{ZnO} \cdot \text{Fe}_2\text{O}_3$) which may be formed during roasting is practically insoluble in sulphuric acid of this strength, so that a proportionate loss of zinc is experienced, the zinc oxide and sulphate formed being readily

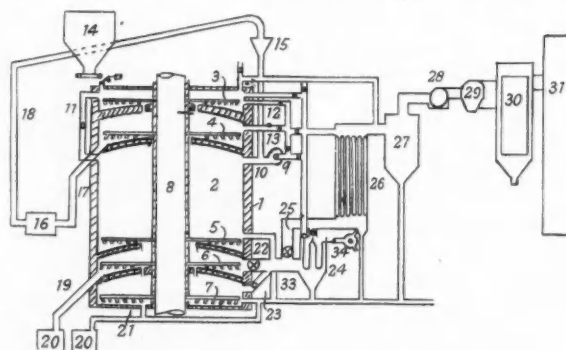


Fig. 2. Arrangement of Apparatus in Suspension Roasting Process.

soluble. Such were the problems encountered in the operation of the electrolytic zinc plant of the Consolidated Mining and Smelting Co. of Canada, Ltd. Some improvement in the consumption of fuel in roasting was effected by operating the Wedge roasters on the "split-draft" system, but the prevention of the formation of zinc ferrite was a much more difficult task. The zinc concentrate treated at the plant concerned contained "marmatite" (in which zinc and iron sulphides are crystallised isomorphously), together with pyrite and pyrrhotite. When using the original roasters it was discovered that practically all the iron in the marmatite was found as zinc ferrite in the calcine, each one part of iron in marmatite rendering insoluble 0.58 parts of zinc. Additional

zinc ferrite was formed by the combination of zinc oxide and ferric oxide derived from the oxidised pyrite and pyrrhotite, the amount so formed depending upon (a) the temperature of the ore-bed, (b) the period of time during which the particles of the two oxides were in contact, (c) the fineness of the particles, and (d) the conditions under which the roast was finished.

For a number of years extensive work was carried on, aimed at developing a method of roasting the concentrates in suspension and this work was brought to a successful conclusion recently by the discovery of the "burning concentrate process." Modified Wedge roasters are employed and the success of the process may be gauged by the fact that of the 25 roasters installed originally only eight have been "modified," but these have sufficient capacity to handle all the requirements of the electrolytic plant. The process is completely autogenous (no external fuel being required), while steam is generated from the waste gases at the rate of two boiler h.p. per ton of concentrates roasted per day.

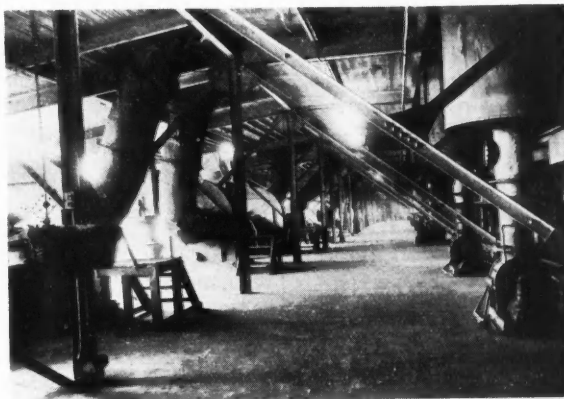
Flash-Roasting Plant

The diagrammatic lay-out of the plant is shown in the accompanying illustration (Fig. 2). The four middle hearths are removed from the Wedge roaster (1) leaving the open space (2) which serves as the combustion chamber. On top of the furnace are the drying hearths (3 and 4), while the collecting and sulphide control hearths (5 and 6) are located at the bottom, each of the hearths being equipped with rables and arms rotating with the central column (8). Auxiliary equipment consists of the circulating and secondary air-fan (9), the burner (10), gas circulating conduits (11, 12 and 13), the wet concentrate hopper (14) and the dried concentrate hopper and feeding device (15). The ball mill (16) is equipped with a feed-chute (17) and an elevator (18) at the discharge end. Through a chute (19) low-sulphate calcine is fed to the Jacoby conveyors (20), while the product from the sulphating chamber (7) passes through a chute (21) to the same conveyors. Gases escape by the main outlet (22) or from the sulphating chamber outlet (23), through a pipe (25) to the vertical water-tube boiler (26). The waste-heat exchanger (24) is normally by-passed except when pre-heated air is required for the burners and in that case the necessary air is blown through the exchanger by a fan (34). From the boilers the gases pass to the cyclone dust-collectors (27) through a fan (28) into the balloon flue (29) thence to the Cottrell plant (30) and finally to the acid-plant (31).

Importance of Temperature Control

The zinc concentrates, containing 51 per cent. zinc, 33 per cent. sulphur and 11 per cent. moisture, are delivered to the 25-ton feed hopper from which they discharge, through a chute rendered air-tight by a gravity operated gate, to the upper drying hearths. The temperature is maintained at 220 to 250° C. by hot gases withdrawn from the combustion chamber and recirculated over the top hearths. The dried concentrates fall through a chute into a lightly-loaded ball mill in which any agglomerates formed during drying are broken up. No actual grinding is necessary as the flotation concentrates are usually about 95 per cent. minus 200 mesh. From the ball mill the material, passing by a bucket elevator to the dried concentrate hopper, is discharged by a belt-feeder through an adjustable gate into two air-injectors delivering to the burners. From the burners, in which it is mixed with secondary air and the moisture-laden gases from the drying hearths, the material is injected into the combustion chamber with considerable turbulence. Ignition occurs very close to the mouth of the burner and a consistently high temperature may be maintained in the combustion chamber. To control the temperature between 900 and 950° C. the hot gases are recirculated over the drying hearths, being withdrawn from the combustion chamber through an annular space around the central shaft into the lower drying hearth. The volume of gas recirculated is regulated to maintain the optimum temperature in the combustion zone.

About 60 per cent. by weight of the solid fed to the furnace collects in the bottom hearth and is discharged to the Jacoby conveyors. The remaining 40 per cent. is carried off in a very finely divided form with the gases, which, when withdrawn from the furnace, contain 9 per cent. of sulphur dioxide and are at a temperature of over 800° C. The gases



Cyclone floor in a Canadian flash-roasting plant, showing the waste-heat extractor fans and the down-takes from the cyclones (right) and the dust discharge mechanism (left).

may be passed through the heat-exchanger if necessary, but in general are delivered directly to the waste-heat boilers, from which they are discharged at a temperature of 260° C. to 320° C. Originally, fire-tube boilers were installed, but water-tube boilers have proved rather more efficient, approximately 200 boiler h.p. of steam at pressures up to 200 lb. being generated per 100 tons of concentrate burned per day. On leaving the boilers the gases pass to two cyclone dust precipitators, in which about 85 to 90 per cent. of the contained solids are precipitated. Solids discharge through a rotary valve or air-seal in the base of the cyclone directly on to the calcine conveyor.

Dust Extraction

The gases, discharged from the cyclones at a temperature of 200° C., have a dust burden equal to about 4 per cent. by weight of the original solids fed to the furnace. Passing through an unlined steel balloon flue, they enter the Cottrell dust precipitator, where about 95 per cent. of the remaining dust is extracted. The over-all efficiency of the dust extraction is 99.5 per cent. and the gases entering the acid plant are practically free of solids.

With the usual run of zinc sulphide flotation concentrates, this plant will treat from 50 to 130 tons per day, with the yield of steam power indicated. The zinc solubility of the roasted products varies from 87 to 90 per cent., while the ferritisation ratio (units of zinc combined with units of iron) has fallen from 0.522 in the original Wedge roasters to 0.46.

In this way the method has been applied to the roasting of zinc sulphide concentrates, giving a roasted product with a very high solubility factor. At the same time it is easily possible to manufacture sulphuric acid from the cleaned gases which carry about 9 per cent. sulphur dioxide.

REFERENCES

- FREEMAN: The utilisation of pyrites in pulp and acid manufacture. Trans. Canadian Inst. of Mining and Metallurgy. 1930.
- FREEMAN: Progress in the flash-roasting of sulphide ores. Trans. Canadian Inst. of Mining and Metallurgy. 1931.
- JENTZ: Flash-roasting pyrite with the Nichols-Freeman system in the manufacture of sulphite pulp. Trans. Canadian Pulp and Paper Association. 1935.
- FREEMAN: The use of pyrite concentrates in sulphite pulp manufacture. Amer. Inst. Chem. Eng. Vol. xxxiii, p. 180. 1937.
- STIMMEL, HANNAY AND McBEAN: The electrolytic zinc plant of the Consolidated Mining and Smelting Co. of Canada, Ltd. Trans. Amer. Inst. Min. and Met. Eng. Vol. 121, p. 540. 1936.
- HUTTL: Producing Zinc. Eng. and Min. Journal. Vol. 130, p. 42. 1938.

Export Groups Formed

Fuel Oil Burners

MEMBER firms of the British Oil Burner Manufacturers' Association have formed the Fuel Oil Burner Export Group under the export scheme fostered by the Board of Trade. Mr. W. A. Hubbard (Combustions, Ltd.), as chairman, and Messrs. O. Meilke (May Oil Burner (England), Ltd.), J. S. Greenhalgh (Babcock and Wilcox, Ltd.), and C. Roman (Nu-Way Heating Plants, Ltd.), form the Executive Committee of the Group. The Secretary is Mr. Stanley Henderson. The Group's offices are at 69 Cannon Street, E.C.4. (Tel.: CITY 4444).

The following firms are members of the Group: Amal, Ltd.; Babcock and Wilcox, Ltd.; S. Batchelor and Son, Ltd.; Combustions, Ltd.; Laidlaw, Drew and Co., Ltd.; May Oil Burner (England), Ltd.; Nu-Way Heating Plants, Ltd.; G. C. Pillinger and Co., Ltd.; Rheostatic Co., Ltd.; Universal Oil Burners, Ltd.; Urquhart's (1926), Ltd.; Wallsend Slipway and Engineering Co., Ltd.; and J. Samuel White and Co., Ltd.

A principal objective of the newly-formed Export Group is to develop overseas markets from which Germany and the countries occupied by German forces are cut off. Arrangements have been made to give special attention to the requirements of markets in the Dominions, Palestine, Egypt, Iraq, Iran, Portugal, the Dutch East Indies and the Far East.

Portable Charcoal Kilns

Central Chimney Dispensed With

THE Director of the Forest Products Research Laboratory has drawn our attention to a slight error in the text of the article "War-Time Charcoal Burning," which appeared in our issue of July 6, and which might mislead an inexperienced person. He points out that the central chimney, as illustrated in that article, is *not* used in the process of carbonisation. Formerly they used a chimney during the first one to three hours after lighting, to draw up the fire, after which it was removed and the central hole sealed over. Now, however, they dispense with the chimney altogether, simply allowing the initial smoke to escape through the central hole and all round the periphery of the lid. The latter is raised on wooden or iron wedges, so as to leave a gap of approximately one inch all round. When sufficient heat has developed (which takes from one to three hours, according to the wetness of the wood), the lid is dropped into place and the central hole sealed. From that point onwards until carbonisation is completed the smoke escapes by the four side flues.

INDIAN IMPORTS OF ALUMINA

The Government of India has decided to encourage production of aluminium for the munitions and armaments industries by exempting imported alumina from the payment of duty. The concession will remain in force until the expiry of four years from now or until adequate supplies of alumina made in India are available at a reasonable price, whichever may be earlier; the decision as to when such supplies are available in India will lie with the Government of India. The quantity of duty-free alumina which will be allowed to be imported during the period of the concession will be decided by the Government of India separately for each firm.

The Government intends, in accordance with this decision, to authorise the Chief Customs Authority to issue orders from time to time permitting the import of alumina free of duty so long as the above conditions are fulfilled.

Chemical Export Enterprise

Financial Expert's Praise

A TRIBUTE to the chemical industries of the United Kingdom is paid by the Industrial Editor of the *Financial News* in an article this week on Export markets. "So far," he says, "the largest measure of success has attended the overseas sales efforts of the chemical, drug, dye and colour manufacturers. Exports of these products rose by as much as 33 per cent., to £21,058,000, in the first eight months of 1940. Even in August last, a poor month for most exports, a further rise was obtained by comparison with August, 1939. It is clear from these figures that the United Kingdom chemical trades, under the strong leadership of Imperial Chemical Industries, can make a considerable contribution to export sales despite the prior claim of armament orders."

New Producer-Gas Vehicle

Efficient Cooling and Cleaning Equipment

THE latest addition to the fleet of producer-gas driven vehicles converted and operated by the Northern Aluminium Co. is a utility car intended for transport between the company's three works. The vehicle is required to undertake single journeys ranging from a minimum of 45 miles to a maximum of 100 miles.

The body, which is mounted on a standard Morris 25 h.p. chassis, was specially designed for the incorporation of a Brush Koala Producer in a compartment at the rear. A problem raised by this arrangement lay in the difficulty of successfully dissipating waste heat from a confined space, but this has been overcome by the provision of specially designed ventilation.

The Brush Koala Producer incorporates the latest type of filter for the efficient cooling and cleaning of the gas. The first stage cleaner, mounted at the off-side, is designed to remove the bulk of the solid impurities and to lower the temperature of the gas. The second stage is carried out by means of two "can" type purifiers installed below the roof, the first containing water and the second oil.

These "wet" purifiers remove injurious constituents such as silica, sulphuric acid, sulphur trioxide and ammonia and any remaining solid particles, while the oil purifier also provides, to a certain extent, upper cylinder lubrication. The sulphurous acid, which is not absorbed by the water, is removed by ferric chloride provided by chemical action in the second stage.

All parts of the plant are placed so as to be readily accessible for easy operation. A feature in the arrangement of the plant, designed to assist cooling, is the forming of the gas tube from the firebox into a large loop under the car.

Initial trials have shown the performance of the vehicle to be very satisfactory. Using "Suncole" fuel, a range of approximately 100 miles is obtained on one filling of the hopper. Speeds of 40 to 50 miles an hour can be maintained comfortably on average roads.

New Control Orders

Import Licensing of Essential Oils

THE importation of essential oils, natural or synthetic, including terpeneless oils and mixtures thereof, from Empire countries and certain French colonies, is, at present, permitted without individual licences. Until further notice no licences will be issued to import from other countries either (a) mixtures of essential oils with or without synthetics or (b) terpeneless and sesquiterpeneless oils. Applications for licences to import other essential oils should be accompanied by a statement of past trade accompanied by a special form obtainable from the Import Licensing Department, 25 Southampton Buildings, London, W.C.2.

Personal Notes

MR. G. A. FRAMPTON, A.R.C.S., chief chemist of Sharples Centrifuges, Ltd., Stroud, has been appointed a director of the company.

MAJOR OLIVER LYTELTON, hitherto Controller of Non-Ferrous Metals, has been appointed Minister of Supply in place of Mr. Herbert Morrison who has taken over the position of Home Secretary and Minister of Home Security.

With all five of their sons in the Army, MR. and MRS. PATRICK ROACH, of Sherwood Road, Buxton, believe they have established a record for Derbyshire. The sons, aged from 26 to 35 and all married, formerly held staff appointments with Imperial Chemical Industries, Ltd.

DR. ARDERN, consulting chemist to the Manchester Corporation Rivers Committee, has retired after 41 years' service with the Corporation. He was associated with Dr. Fowler in the origination of the activated sludge process of purification of sewage, now widely in use throughout the world.

DR. ANDRE LABARTHE, who was Professor of Physics at the Sorbonne, has undertaken to be director of a new faculty of science to be founded at the French Institute in London. It will be devoted to research into the application of science to this war and the publication of a scientific review, of which the first number is due on October 15.

MR. LEONARD DRAWDEN, recently of Blackpool, is now engaged on Government work of a secret and highly important nature. Mr. Drawden is well known in the chemical trade, having been for 21 years analytical chemist with a big Sheffield steel concern. For several years after that until 1938 he was engaged on his own account as a manufacturing chemist in Preston.

MR. GEORGE ARCHIBALD HOWE, manager, and MR. GEORGE SAMUEL SEWELL, engineer, both of Shell Mex and B.P., Ltd., and MR. WILLIAM SIGSWORTH, manager, Anglo-American Oil Co., Ltd., are among the first recipients of the George Medal. The awards were made in recognition of their gallantry in helping to extinguish fires following an air-raid on an oil-depot on the East Coast.

The President and five members of the Royal Society, SIR WILLIAM BRAGG, O.M., K.B.E., DR. E. V. APPLETON, SIR EDWARD MELLANBY, K.C.B., SIR EDWIN BUTLER, C.M.G., PROFESSOR A. V. HILL, O.B.E., M.P., and PROFESSOR A. C. EGERTON have been appointed as a Scientific Advisory Committee, under the chairmanship of Lord Hankey, to ensure the continuance of the fullest co-operation of scientific workers with the Government in the national war effort.

OBITUARY

MR. ALFRED TREACY, of Hunt's Cross, who died last week aged 79, had long been associated with the chemical trade of Widnes. For many years he was traffic manager for I.C.I., West Bank Dock, but retired some time ago on pension. He had been in failing health for three years.

MR. ARTHUR COURTNEY, who died at Ladron, St. Austell, last Saturday, was a leading figure in the china-clay industry, having been chairman and managing director of the Great Longstone China Clay Co., Ltd. He was also a prominent member of the Rubber-Growers' Association.

MR. RAMSAY CADOGAN SMITH, who died last week at Dalton-in-Furness, aged 89, was, until he retired, proprietor of the Stanley Chemical Works, Dalton, established by his father some 80 years ago. Mr. Smith joined the concern in 1880, and 15 years later he assumed full control.

DR. ALEXANDER CHARLES CUMMING, O.B.E., who died recently of heart-failure while on a shooting trip at Meifod, Montgomery, aged 60, was a prominent industrial chemist. He was a director of the United Molasses Co., Ltd., and chairman of Ramis, Clark & Co., Ltd., a Scottish chemical company. Formerly he was also managing director of Macfie and Son, Ltd., the Liverpool sugar refiners. He was awarded the O.B.E. for organising T.N.T. factories in Leith and Edinburgh in the last war.

Sir Robert Hadfield

We regret to record the death, which occurred in London on Monday, September 30, of Sir Robert Abbott Hadfield, Bt., F.R.S., Hon. D.Sc., F.I.C., F.C.S., the prominent metallurgical chemist and industrialist, in his 81st year.

It was in connection with the development of manganese steel that Sir Robert Hadfield's name came prominently to the fore as a metallurgical investigator. He produced the first specimen of it in 1882 and six years later he read to the Institution of Civil Engineers his first paper on it, this being followed by numerous others. He went further than this by bringing his discovery into practical use. Manganese steel has been widely applied in engineering and mechanical constructions where the highest resistance to wear is required. Another alloy of iron, with silicon, known as "low hysteresis steel," he described before the Iron and Steel Institute in 1889. This is used extensively in electrical transformers. Sir Robert also devoted much attention to many other alloy steels, containing such elements as aluminium, chromium, nickel and tungsten. In this connection he studied specimens prepared in the early part of last century by Faraday. He carried out about 470 chemical determinations and described the results in his book, "Faraday and His Metallurgical Researches."

In a laboratory fitted up for him by his father, the owner of a steelworks, Hadfield began his investigations soon after leaving the Collegiate School of his native Sheffield, where he was born in 1859. Later, he greatly extended his father's works, and, before reaching the age of 30, became chairman and managing director of the firm on its conversion into a limited company. An early advocate of the 48-hour working week, he introduced it into his works soon after they came under his control. Invaluable work in the production of munitions was done by his firm in the last war. They made nearly three-and-a-half million shells, mostly for the Army, apart from armour-piercing shells for 18-in. guns. The firm obtained an important American contract for large-calibre armour-piercing projectiles early in 1917. Sir Robert served on the Munitions Inventions Committee and other bodies and with Lady Hadfield he established and maintained throughout the war a hospital at Wimereux, near Boulogne, which received about 20,000 officers and men.

In recognition of his work, particularly on manganese steel, he was awarded the John Fritz medal, the highest honour which American engineers have to offer to one of their profession. It was handed to him by a deputation which, representative of the four great American engineering societies, came to this country for the purpose in 1921. Among numerous other honours bestowed upon him were the award of the Bessemer gold medal by the Iron and Steel Institute; the Howard quinquennial prize and premium and the George Stephenson and Telford gold medals and premiums by the Institution of Civil Engineers; one special gold medal and two other gold medals by the Société d'Encouragement pour l'Industrie Nationale; and the John Scott medal and premium and the Elliott-Cresson gold medal by the American Franklin Institute. In addition to possessing the degrees mentioned above and many honorary degrees, he was a fellow of numerous other societies and had been president of several.



Bronze bust of Sir Robert Hadfield, presented to him by directors of Hadfields, Ltd., to mark his 70th birthday

General News

MESSRS. A. BOAKE, ROBERTS AND CO., LTD., have taken offices at "Ellerslie," Buckhurst Hill, Essex (Tel.: BUCKhurst 2253; 4 lines).

THE TEMPORARY OFFICES of the Society of Chemical Industry are at the Imperial College of Science and Technology, London, S.W.7.

THE OFFICES of the Wholesale Drug Trade Association are now housed in the N.P.U. building, 4-5 Queen Square, London, W.C.1. (Tel.: TERminus 5118).

THE LIGHT CASTINGS INDUSTRY in Central Scotland has been seriously affected by the restriction of building operations. Mr. Hugh Murdoch, general secretary of the Ironfounding Workers' Association, in his half-yearly report, states that the membership has decreased by 370, the total now being 10,747.

THE COUNCIL of the SOCIETY of PUBLIC ANALYSTS and other Analytical Chemists, or its Emergency Committee, will decide later regarding the holding or cancellation of the November and subsequent meetings. Members will receive due notice of meetings which are to be held, but no further notices of cancellation will be sent.

TRADERS ARE REMINDED of the necessity for distributors and retailers to increase the amount for which their stocks are insured under the War Risks Insurance Act, 1939, when the Purchase Tax comes into operation, by the amount of the tax paid. The President of the Board of Trade, in reply to a question by Sir Granville Gibson in the House of Commons, emphasised that the insurance of stocks must be for the full value for the time being of the goods insurable under Part II of the Act.

AN OFFICIAL COMMITTEE, composed of prominent members of the medical profession, has drawn up a list of substitutes that may be used in place of drugs which it is undesirable to import in war-time in order to avoid the use of foreign currency and to save cargo space. All the banned drugs are of vegetable origin and come from all parts of the world; adequate supplies of substitutes are available and, in the opinion of the committee, these possess therapeutic properties similar to the drugs they will replace.

ACCORDING TO THE BOARD OF TRADE RETURNS for August, 1940, imports of chemical, drugs, dyes and colours into the United Kingdom were valued at £1,624,612, an increase of £42,223 compared with the figure for August, 1939. Exports were valued at £2,200,641, an increase of £276,423, while re-exports, at £36,025, showed a decrease of £18,938. For the eight months to August 31, imports increased in value by £1,953,873 to £13,108,011, and exports by £5,188,834 to £21,058,334. With this last figure the chemical trade maintains its pre-eminent position in the export drive among the 21 groups of articles wholly or mainly manufactured, as listed by the Board of Trade.

Foreign News

IT IS REPORTED that a new company is in process of being formed to work the nickel deposits recently discovered at Levitunturi, in the extreme north of Finland. A controlling majority of its shares will be held by the I.G. Farbenindustrie, of Frankfurt-on-Main.

THE ANGLO-AMERICAN CORPORATION recently pegged out four blocks of magnesite on Barton Farm, about eight miles from Gatooma, states *The New Rhodesia*. It is stated that 20 tons of the ore have been mined and sent to Johannesburg for analysis and testing.

TIN DEPOSITS estimated at some 500,000 tons have been discovered in Egypt, states Reuter, at Wadi el Agala in the neighbourhood of Kossair on the Red Sea coast. The veins, which are rich in tin, cover an area of several square miles. The Egyptian Under-Secretary of Finance has declared that the mines should produce about 15,000 tons of pure tin annually.

OUTPUT OF CADMIUM IN CANADA in 1939 totalled 939,691 lb., valued at \$662,209, compared with 699,138 lb., valued at \$561,799, in 1938; the quantity of the 1939 production was a record in Canadian production of the metal. Of the total, 799,523 lb. valued at \$563,241, were produced in British Columbia, 73,830 lb., valued at \$52,029, in Manitoba, and 66,608 lb., valued at \$46,939, in Saskatchewan.

From Week to Week

TESTS ARE BEING MADE by the Broken Hill Proprietary Co., Ltd., of a deposit of dolomite at Port Gibbon, 85 miles south of Whyalla. This mineral is a calcium magnesium carbonate of varying proportions, and is of service as a flux and as a source of light metals for aircraft construction. The Port Gibbon deposit has been the subject of reports by the South Australian Department of Mines and is stated to be of good quality. It is anticipated that favourable reports on the tests being carried out will probably result in the opening up of a new port.

CANADIAN PRODUCTION OF VIRGIN ANTIMONY in 1939 totalled 1,225,585 lb., valued at \$151,469. Of this, the major part represents antimony metal recovered in the British Columbian metallurgical plants of the Consolidated Mining and Smelting Company of Canada, Ltd. In addition, there were relatively small quantities contained in ores exported from Nova Scotia and British Columbia. Prior to the close of 1938, there had been no commercial production of antimony in Canada since 1917, and no by-product production since 1926, when it was reported as contained in silver-lead-bismuth bullion produced from cobalt-silver ores mined in Northern Ontario.

British Chemical Prices

Market Reports

THE demand for general chemicals continues on a moderately good scale with offers of most items quickly absorbed. Regular deliveries are maintained from home makers and contract specifications cover good volumes. Movements in the potash and soda products and heavy acids are of about normal proportions. The tone of the market is strong with no important changes in values to record. The demand for coal tar products has shown slight improvement since last week both for home and export, chiefly in the direction of solvent naphtha and xylol for domestic consumption and naphthalene and cresylic acid for export, but with dislocation in the post and in transporting goods, business is not at all easy. Otherwise there is little market fluctuation to report.

MANCHESTER.—Chemicals on the Manchester market during the past week have attracted a moderate amount of attention from fresh buyers and, on the whole, there has been relatively little of which to complain so far as movements against contracts are concerned, though in one or two directions these are subnormal owing to the prevailing conditions. Textile bleaching, dyeing and finishing materials are still being taken up in fair quantities. Values throughout the range are on a steady to firm basis. Among the by-products, cresylic acid, crude carbolic and pyridine have tended to be easier, but in other directions the market has been maintained and trading conditions have been fair.

GLASGOW.—Business in the Scottish heavy chemical trade tended to show slight improvement during the week. Prices for the home market remain steady.

Price Changes

Carbolic Acid.—MANCHESTER: Crystals, 10½d. per lb., d/d.; crude, 3s. 9d. to 4s., naked, at works.

Copper Sulphate.—About £29 10s. per ton, f.o.b.

Lead Acetate.—White, £46 10s. to £48 10s., ton lots.

Magnesium Chloride.—Solid (ex wharf), £12 to £13 per ton.

Magnesium Sulphate.—Commercial, £10 to £12 per ton, according to quality, ex works.

Naphtha.—Solvent, 90/160°, 1s. 11d. to 2s. 1d. per gal; Heavy, 90/190°, 1s. 7d. to 1s. 8d., naked at works, MANCHESTER: 90/160°, 1s. 11d. to 2s. per gal.

Naphthalene.—Crude, whizzed or hot pressed, £14 per ton; purified crystals, £27 per ton in 2-cwt. bags; flaked, £27 per ton. Fire-lighter quality, £6 to £7 per ton ex works. MANCHESTER: refined, £26 per ton.

Pitch.—MANCHESTER, nominal.

Pyridine.—90/140°, 19s. per gal.; 90/160°, 17s.; 90/180°, 4s. to 5s. per gal., f.o.b. MANCHESTER: 16s. to 19s. per gal.

Tartaric Acid.—MANCHESTER: 2s. 6d. per lb.

Latest Oil Prices

LONDON.—October 2.—For the period ending November 2, per ton, net, naked, ex mill, works or refinery, and subject to additional charges according to package and location of supplies:—**LINSEED OIL**, raw, £41 10s. **RAPESEED OIL**, crude, £44. Other controlled prices as last month. **ROSEIN**, 30s. to 35s. per cwt., ex wharf, according to grade. **TURPENTINE**, 55s. per cwt., spot, American, including tax, ex wharf, barrels, and ex discount.

HULL.—October 1.—American turpentine, spot, 57s. per cwt., in barrels, ex store.

Metallurgical Section

October 5, 1940

REFINING SCRAP COPPER Details of Modern Preliminary Treatment

by A. G. AREND

WHILST a considerable number of articles have been published on the refining of copper, practical details of the large-scale treatment of scrap copper are somewhat meagre, and have not been utilised to any great extent since after the last war period. It is probable that similar methods may be revived again in order to conserve this metal as far as possible, at the present time. In the intervening years there has not been the same call for the handling of large tonnages of scrap copper, as there has not been any great source from which it could be derived, with the result that it has been more or less refined in small furnaces. After the last war period, large reverberatory hearths were constructed in different parts of the country to cope with the surplus war munition material, but when these tonnages had been accounted for, they had to be dismantled. Scrap copper comes from a wide variety of sources, and is very apt to be contaminated with brass.

Apart from cartridge cases, condenser tubes and coils, cable, electrical connections, sheets and wire, there are almost innumerable smaller sources, such as rivets, pins, and links required in the present shipbuilding drive, which provide sources of scrap copper. In peace time much of this copper is not available, and sources are represented by old metal from dismantled brewery plant, mineral water plant, food products, wire and cable from tramway systems, tubes and coils from chemical processes, and turnings from engineering shops, to mention but a few.

The total, however, is comparatively small compared with what accumulates during war periods, and accordingly provisions have to be made to reclaim it with the least possible delay. Many improvements have been made in the machines used for handling the scrap metal, but as remarked, there has not been the same opportunity to utilise them.

Treatment of Pressed Blocks

After the last war period, cartridge cases were collapsed in hydraulic presses, but to-day similar presses are operated by geared electric motors which function much more rapidly, and facilitate continuous working. When collapsed, the cartridge cases are represented by an almost solid block of metal, and the latest type of bottom-die is slightly curved so as to assist easy charging of the product on to the hearths, so that no undue spaces are left, a disadvantage that occurs where square blocks are pressed out. Overhead runways supply the presses from the bulky raw material, which is stacked outside the main building and thus economises in working space. The pressed blocks are then placed in small trucks, or bogies, and run directly to the refining furnaces.

With fuses, care has to be taken that no material such as gainé is present which could cause explosions, and for this reason an earlier practice, which will probably be revived, is to have all such scrap metalliferous waste burned in open heaps prior to compressing. Returns from small-arms works and quick-firing cases require individual inspection to ensure complete freedom from any source of danger. At the end of the last war period, live primers of unexploded charges and blank ammunition were found, which, had they been inadvertently added to the melting

charge, might have caused serious harm to both furnace and operatives.

So much brass material occurs with copper that discrimination is sometimes almost impossible, and for this reason when the copper predominates as a really high percentage, it is often economical to refine it to ingot copper. Thus, although cartridge brass can be added to yellow brasses, etc., to make any specific brass alloy, too much time is apt to be lost, and large unused accumulations have to be kept in reserve. Although refining of these rich copper materials to ingot copper means the sacrifice of the zinc content, it provides a direct and immediate source of pure copper.

Improved Sweating Furnace

Various types of condenser tubes and heating coils, also worms and pipe lines of copper and 70/30 brass, have their ends tinned and soldered, and so, when these are directly charged into the melting furnace, they represent a source of loss, as the tin is directly burned off. After the last war period, all such tubes had the ends cut off and placed in a small sweating furnace heated by gas firing. Of recent years, an improved design incorporates a rotary sweater equipped with a cylindrical drum of perforated metal, with the gas-burners supplying the heat from outside. By this means, all such tube-ends and soldered parts have the low-melting-point metals run off continuously and collected in a small kettle situated outside the main hearth. The still hot de-tinned tube ends are run into bogies, and wheeled directly to the melting furnaces. Many copper pipe lines have joints, valves, couplings, and T-pieces of brass connected, which would offer too much work to be worth while disconnecting. Hence the lot is simply cut up into convenient lengths in guillotine machines and transferred to the furnaces. Scrap wire and cable is another source of copper with tinned ends, but these are rarely treated.

Insulated cable is placed in large heaps on the ground and ignited, after which the enclosed copper wire is run through a bundling machine. The latest types of these latter machines curl the wire through a tight connection in a tube, and after passing this, the material is cut off in cylindrical blocks which are compressed almost to solid condition.

The heavier type of copper tube and liner occupies much time in breaking down to furnace size, and in small factories this is carried out by placing the material on open fires, and breaking it with the sledge hammer while still hot. The use of acetylene or electric-arc cutters for this purpose has been abandoned as being uneconomical, and what appears to be the best system at the present time is to make use of an old annealing hearth, and after raising the heavy tubes to a dull red heat, to pass them under a steam hammer. A difficulty which must not be overlooked is that unless properly broken, the circular parts of heavy tubes would occupy much space within the hearth. Turnings of copper are springy and do not lend themselves to easy briquetting, as do many of the finer brass borings, etc., and, further, are often obtained in lengthy strands. The ordinary briquetting press will sometimes suffice to compress them to solid block condition, but better results are usually gained by pressing

the heated mass, as the internal crystalline structure more readily breaks down. Some refiners believe in including a small proportion of flux in the borings and turnings prior to briquetting, so that on melting, the oxides will be more readily fluxed. Much of the success of the subsequent melting operations is dependent upon forming all scrap into as compact a mass as possible, so as to reduce melting losses to a minimum.

Most refining to-day is carried out electrolytically so as to acquire the highest grade of copper for all purposes, as opposed to the pyro-refining methods adopted after the last war. In the large American refineries, ores and purchased mattes are included in the work, and blast furnaces furnish a crude matte which is passed into converters, to which all scrap copper is also added. The impurities present in the copper, such as brass, solder, tin, etc., are largely absorbed or evolved by the sulphur of the matte. Thus tin and antimony, which form volatile sulphides, are removed to the fume to an appreciable extent, whilst iron and zinc are more directly absorbed by the matte. This dual use of the converter has been widely developed within the past few years, but it is doubtful whether it is employed to any extent at present in this country. The fact that much of the copper from tramway wires contained silicon, together with the zinc, tin, and iron from brass inclusions, all of which are oxidisable elements, earlier led to direct oxidation treatment. All available sources of copper scales, and copper oxide from coppersmithing work, were accumulated, and added to the charge. Lengthy reverberatory furnaces fired by coal were used and, after melting, the copper was exposed to the air and frequently rabbled. The first scum to form on the surface was removed with perforated ladles, without the addition of slag or flux, and was represented by a light oxide powder. Small additions of copper scales were added at intervals. By this treatment, the silicon and zinc burned off first, followed by the iron, and finally by the tin and any little antimony present, but more difficulty was experienced in accounting for the lead. After the oxidation had progressed for some time and most of the zinc had been removed, fine silica sand was added which absorbed the other oxides into a slag. The reason for removing the first zinc oxides in "dry" condition without silica as flux is to prevent the formation of the infusible zinc silicate. Special addition agents were later added to eliminate lead, but the process was usually unduly prolonged.

The Electrolytic Process

With the advent of the electrolytic process, all impurities were more or less completely recovered, which helped to pay the costs, whilst the highest grade of copper was recovered. The laborious oxidation and final deoxidation of the copper was obviated, as all scrap metal had simply to be melted and run into anode moulds, in accordance with the process most widely used throughout the world at the present time. When dealing with scrap copper, a greater strain is put on the system, as the presence of excessive impurities tends to foul the electrolysis bath and necessitates periodical replacing, but otherwise the process is the same. All briquetted and baled scrap, tubes, wire, turnings, etc., are simply melted directly in lengthy reverberatory furnaces in which one end is kept at a much higher temperature than the other. As the molten metal reaches the hot end, it is run into anode moulds which are mounted on a train or wheel system.

Even though this rapid system of converting to anodes should result in blowholes in the metal, it does not interfere with the subsequent electrolysis, but tends to increase the resistance to the passage of the current, and, therefore, some refiners prefer to carry the initial melting a stage further, so as to ensure a more perfect anode plate. Whether the train or wheel system is adopted, the whole is caused to be immersed in water, whereby the cold anodes can be removed without delay. Where worked in a smaller way, rotary furnaces are employed, and these have the advantages of occupying little space and leaving no cold spots

within the hearth on account of the continual rotation. Fuel oil is the best heating medium and gives easy control of the temperature and conditions. The anodes, after being removed from the quenching water, are placed on battery locomotives and taken to the electrolytic department where they are immersed and then attacked by the action of acid and current until only a very thin skin remains.

Practical details of the electro-refining process have previously been published, and no difference is made because the cruder copper from scrap accumulations is used. Current is applied at 10 amps. per square foot, and a temperature of 50° C. is maintained throughout, whilst the resistances caused by the presence of excessive impurities should not cause the voltage to exceed 5 volts. The refining is conducted with both hydrochloric acid and sulphuric acid electrolytes, but the latter is the more popular, and the composition of the solution is adjusted so as to represent 16 per cent. copper sulphate, and 10 per cent. sulphuric acid. The cathodes so obtained are raised from the baths, washed with hot water, and melted to ingot form, the latest practice being to employ small arc electric furnaces which do this final melting in the minimum of time.

Binders for Coating Mixtures

Silicates and Dextrin

AN aqueous solution of sodium silicate, Na_2SiO_3 , is the common binder, according to Bureau of Mines Inf. Circ. 7121, for coating mixtures for welding, i.e., for fluxes or reaction substances added to the outside of welding rods or electrodes to stabilise and protect the arc and to provide a method of depositing fluxes on the welds and form slag, which is easier than dipping bare rods into a container of flux and thus carry it to the point of welding. Potassium silicate is also used, being cheaper in Europe than the sodium compound. Both serve as flux ingredients in the coating. Sodium silicate is white to grey-white as lump or powder and is soluble in water and alkalies, but insoluble in alcohol and acids. It is marketed dry or wet as solutions of various concentrations ranging from viscous semi-liquids to thin, watery fluids. It has many uses, including the binding of minerals on electrodes.

In B.P. 425,443 (1935) a plasticising agglutinant is added to the coating mixture, and the coated rod is heated to dehydrate it. In this case the agglutinant consists of 3 per cent. water-soluble glue, $3\frac{1}{2}$ per cent. inorganic ester of glycol, such as boron ester, and 16 per cent. water. This agent acts as a reducing substance.

U.S.P. 2,158,984 (1939), issued to A. R. Lytle and T. H. Vaughn and assigned to the Oxweld Acetylene Co., calls for a metal core, such as one of bronze, provided with a coating of borax and boric acid, together with a thermoplastic resin, which emits no disagreeable fumes and deposits no char that would interfere with the welding operation.

Dextrin, a gum as powder or granules made from various organic materials (starches for example), is also used as a binder. It is soluble in water but insoluble in alcohol and ether.

PROGRESS OF MODERN STEELMAKING

"THE ECONOMIC HISTORY OF STEELMAKING, 1867-1939: A Study in Competition," by D. L. Burn, recently published by the Cambridge University Press (27s. 6d. net), presents a continuous picture of the progress of this vital industry—its internal organisation, its reactions to changes in the distribution of raw materials, to technical improvements, to foreign competition, its relation to labour and to the national wealth. The story opens with the Paris exhibition and continues through the critical 'seventies and 'eighties, the expansion of the 1900's, the extraordinary conditions of the war years 1914-18 and the "black decade" that followed them, to end with the Sankey and May reports.

Rare Metals in Industry Some North Australian Sources

AN interesting discussion of the mineral phosphates containing rare metals that occur in the Northern Territory of Australia is contributed by Albert E. Williams, formerly Commonwealth Assayer at Darwin, to the July 10 issue of *The Chemical Engineering and Mining Review*.

Many of the minerals, such as tantalite, wolfram, columbite, and scheelite, are of acknowledged commercial importance. Among the lesser-known minerals that likewise occur, amblygonite and monazite are of special interest. These are sources for lithium, cerium, lanthanum, didymium, and thorium, rare metals which, with their compounds, are finding increasing applications in many branches of industry.

Amblygonite.— $\text{LiNa}[\text{Al}(\text{F.OH})\text{PO}_4]$ —is a phosphate of aluminium and lithium, portion of the latter being replaced by sodium. If the lithium is almost entirely absent, the mineral is termed sodium amblygonite. It usually contains some water by the replacement of fluorine by OH. It is a white crystalline mineral somewhat resembling albite felspar. The specific gravity, 3.1, is, however, higher than that of felspar. In the Northern Territory it occurs coarsely crystalline near the surface, exhibiting perfect basal cleavage, all cleavage faces being pearly in lustre. External alteration resembling in appearance the kaolinisation of felspar is a characteristic feature of surfaces exposed to weathering. At some feet from the surface, the mineral is more massively crystalline, cleavages while distinct being less marked. Some specimens are yellowish, especially on cleavage planes due to slight staining by iron oxide. On heating in the flame (fusibility 2) the mineral intumesces, and after the action ceases, is white and stony. The hardness is 6.

The mineral occurs as veins and large segregations associated with pegmatite dykes containing both cassiterite and tantalite. Its origin is partly the result of pneumatolytic action, the alkaline oxides, Na_2O and Li_2O , fluorine and water being derived from volatile gases, mineralisers similar to those aiding the formation of the pegmatite rocks, but apparently traversing fissures at a later stage in their development. A peculiarity of the occurrence is the marked increase in lithium oxide content toward the surface, the coarsely crystalline mineral containing as high as 8 per cent. lithium oxide. This is probably due to the volatility of the lithium-bearing gases and factors influencing crystallisation.

Amblygonite is in demand as a source of lithium compounds. The silicate mineral spodumene is the chief source of raw material for the manufacture of lithium salts; much more lepidolite (lithia mica) is mined but is principally used in the glass industry. Lithium compounds are used in increasing amounts in the manufacture of glass, in medicine, and in pyrotechnics. Amblygonite used directly seems to be beneficial in ceramics and is so used in France.

Source of Thorium

Monazite.— $(\text{CeLaDi})\text{PO}_4$ —is an ortho-phosphate of the rare earths cerium, lanthanum and didymium, which always contains thorium, sometimes as much as 9 per cent., but usually varying between 5 and 7 per cent. It is to this thorium content that monazite owes its commercial value. Thorium nitrate is extracted for use in the manufacture of incandescent light mantles, the composition of which is 99 per cent. thorium oxide and 1 per cent. cerium oxide.

Metallic cerium and its salts, however, have a widespread yet limited application in industry. Probably the most important commercial use of cerium is in the manufacture of arc-lamp electrodes, adding to the illuminating power and improving the colour, and also in the manufacture of the "Nernst" filament. Cerium also has a limited application in the manufacture of the so-called pyrophoric alloys, misch metal, and in alloys of aluminium and magnesium. The

first named are in use for cigarette lighters, tracer bullets, and devices for defining the flight of shells.

A small amount of cerium (usually 0.2 per cent.) added to aluminium has a purifying effect, greatly improving its physical properties. Other uses include flash-dyed powders, catalysts in the contact method for the manufacture of sulphuric acid, and in the union of hydrogen and nitrogen in the process for the synthesis of ammonia, in tanning, the preparation of enamels, and in photography. Cerium oxalate has slight use in medicine. Cerium sodium sulphate is used in the catalytic oxidation of aniline to aniline black, and ceric sulphate in acid solution is also said to be an efficient oxidising agent for aromatic hydrocarbons.

A New Pickling Process

Greater Speed and Economy Claimed

THE descaling of iron and steel at the works prior to applying the first coat of protective paint can be effected by sand-blasting or by acid pickling. Of these acid pickling seems to be the most favoured in practice. Sulphuric acid is usually employed for the acid pickling process on account of its lower cost in spite of the drawbacks of having used a pickling bath at a temperature of 70° to 90° C., of the carbon deposit frequently left on the surface of the metal, and of the progressive accumulation of ferrous sulphate in the solution which reduces the rapidity of the reaction and may at certain low concentrations cause deposition of difficulty removed dehydrated ferrous sulphate on the metal. Hydrochloric acid avoids most of these difficulties, but brings with it the possibility of absorption of hydrogen in the metal and the impossibility of regenerating the spent acid solutions by any practicable method.

The nearest approach to regeneration of the hydrochloric acid solution is a process in which after normal pickling with hydrochloric acid at atmospheric temperature until no free acid exists, the temperature is raised to 50° C. at which temperature concentrated sulphuric acid is added to regenerate the solution partially according to the reversible equation: $\text{FeCl}_2 + \text{H}_2\text{SO}_4 = \text{FeSO}_4 + 2\text{HCl}$.

It is now announced that a modified hydrochloric acid process has been in successful operation in Belgium for some time, devised by Dr. P. de Lattre, in which the active agent is not the free acid but ferrous chloride. This avoids such difficulties as the evolution of HCl fumes, the continued increase of ferrous sulphate in the solution, and the absorption of hydrogen by the metal; ferrous chloride is in itself an efficient cleaning compound. The new process is based upon the reversible equation given above in accordance with the law of mass action. The most favourable conditions are said to be obtained when the pickling liquor contains per litre, 1 gm.-mol. of ferrous sulphate, between 1 and 2 gm.-mols. of HCl, and 1 gm.-mol. of H_2SO_4 . This solution is used at a temperature of 50° to 55° C., maintained by steam heating coils. To this solution is added an inhibitor consisting of gelatin peptonised by HCl.

Essentially the descaling material consumed is sulphuric acid, the quantity of hydrochloric acid used being only that lost mechanically. The articles to be pickled are dipped in the cleaning tank and agitated therein and, after draining, are washed in a second tank, the liquor in which slowly becomes a weak pickling liquor and is later used as make-up liquor. The advantages claimed are increased speed of pickling due to better control of the concentration and temperature of the solution, reduction of hydrogen absorption coupled with thorough cleaning of the surfaces, recovery of the pickling liquor, decreased costs due also to a reduced loss of iron, and a reduction of heating costs through the lower temperature of the bath.

Tellurium Lead*

Advantages in Acid Plant Construction

IN recent years the alloy called tellurium lead, known in different countries under various trade names, has made great headway in chemical manufacturing plants. Linings of acid-containing tanks and pipes, conducting corrosive liquids are now often made of tellurium lead instead of chemically pure lead. Practice has shown that increase in efficiency or, alternatively, saving in material used for lining is in most cases considerable.

Under the most generally used patent, the tellurium content of the alloy does not exceed 0.55 per cent. and is usually between 0.45 and 0.50 per cent., the balance being ordinary double-refined, or preferably triple-refined, lead in which impurities are very low. Consequently the actual lead content of the alloy will exceed 99.9 per cent., and will often reach 99.95 per cent., an amount sufficient to ensure that all the chemical and mechanical advantages inherent to lead metal will be operative in the alloy. In addition, the properties brought in by the relatively small admixture of tellurium metal are fully developed.

Tests carried out with sulphuric acid have been especially impressive. The Houlder flash test was used to determine the percentage of weight of lead plates dissolved in 98 per cent. acid in 20 minutes, calculated from the time of reaching boiling point. During this test chemically pure lead plates lost 92 per cent. of their weight while tellurium lead lost only 55.5 per cent. The results of this laboratory test were subsequently confirmed in practice where it was found that tellurium-lead linings lasted nearly twice as long as pure lead of equal thickness.

The most outstanding result was obtained in a factory using concentrated sulphuric acid. Before the introduction of tellurium lead the tank linings had had to be replaced every two months. Tellurium lead linings in the same tanks now last six months. In other cases, lead pipes and coils were replaced by tellurium alloy with similar success. Sulphuric acid is, in effect, the specific field in which tellurium lead has met with the greatest success, although with

other acids also results have been good. Hot hydrochloric acid seemed to be the least satisfactory material with tellurium lead plant, but even in that field the saving in material reached between 5 and 20 per cent.

It is interesting to note that there is very little difference in the temperatures necessary to bring about a strong dissolution of chemical lead and tellurium lead respectively. In sulphuric acid the temperatures, as recorded by laboratory tests using British Standards Institution methods, were 330.8° C. and 327.5° C., the former figure representing tellurium lead. The great difference observed in actual practice is therefore due to slow corrosive action rather than to high resistance against influences of temperature. The corresponding laboratory measurements, recording the loss of weight in 98 per cent. sulphuric acid kept at a temperature of 250° C., are as under:—

	Tellurium Lead	Chemical Lead
Loss in 1 hour	2.5 per cent.	4.0 per cent.
Loss in 2 hours	3.4 " "	5.2 " "
Loss in 3 hours	4.2 " "	6.4 " "

An additional advantage of tellurium lead is the uniformity and smoothness of surface after corrosion, as contrasted with the uneven structure of ordinary lead. This is due to the very fine and uniform grain structure of tellurium lead as revealed by the microscope.

The work-toughening properties of tellurium lead and its increased resistance against freezing and vibration have led to its wide use in towns as water-pipes. In practice it has been found that a reduction of from 25 to 50 per cent. in wall thickness and a corresponding saving in weight is possible by using tellurium lead, without any decrease in the life of the pipes. On the contrary, it has been found that tellurium-lead pipes at the reduced wall thickness stood up better against vibration and strain than the correspondingly thicker lead pipes. If there are great fluctuations in water-pressure the tellurium-lead pipes will be found especially useful.

Swiss Aluminium

Nazis Stop Transfer to U.S.A.

AN attempt by the Swiss Aluminium Co., of Lausanne, one of the leading producers of the metal, to transfer operations to the United States has been stopped by the Nazis, who, according to the *Wall Street Journal* (reported by Reuter), are said to be exercising a strong influence on the Swiss Government. Official quarters in Washington believe that the Germans did not want production moved to a place where it would become available to the British, and that Germany has her own ideas about the company's future. The company's officials in New York revealed that there would be ample supplies of bauxite for aluminium production in the United States, but did not disclose their source.

The latest edition of "Barimar Scientific Welding Repairs to Industrial Machinery," a profusely illustrated booklet issued by BARIMAR, LTD., 14-18 Lamb's Conduit Street, Theobald's Road, W.C.1, describes that firm's service for the welding and machining of every class of important machinery in all metals and alloys. It is suggested that owners sending parts for repair should state whether the machines are needed for work of national importance.

* From an article by J. P. Powell, *Chem. Eng. and Mining Rev.*, 1940, 32, 382, p.381.

Manganese Development in U.S.

Government Interests Involved

THE Anaconda Copper Mining Co. has received a contract for the supply of 240,000 long tons of concentrated manganese ore to the Metal Reserve Company, a U.S. Government corporation, to be delivered at the rate of 80,000 tons a year. The ore will largely come from the Emma mine in Butte, operated under lease by the Anaconda and owned by the Butte Copper and Zinc Company. Arrangements have been made to ship the ore to Government supply depots to establish a stock-pit of manganese concentrates. While the contract with the Government calls for the annual delivery of 80,000 tons of high-grade concentrated manganese, the Anaconda Company is increasing the capacity of the mining property to handle 300,000 tons of ore to yield 100,000 tons of concentrate a year. In addition, the company will spend approximately \$1,500,000 on the construction of a nodulising plant at the Washoe reduction works and the conversion of a section of the present copper concentrator into a manganese concentrator.

The U.S. Navy has completed its first tests of samples of manganese ore from the recently discovered veins near Presque Isle, Maine. Analysis revealed 20 per cent. manganese content, 20 per cent. silica and traces of aluminium. Officials are dissatisfied with the high silica content, which they consider too large for commercial operation. Further mill-run tests might indicate a higher manganese content, however, since samples previously tested are stated to have shown a manganese content of 40 per cent.

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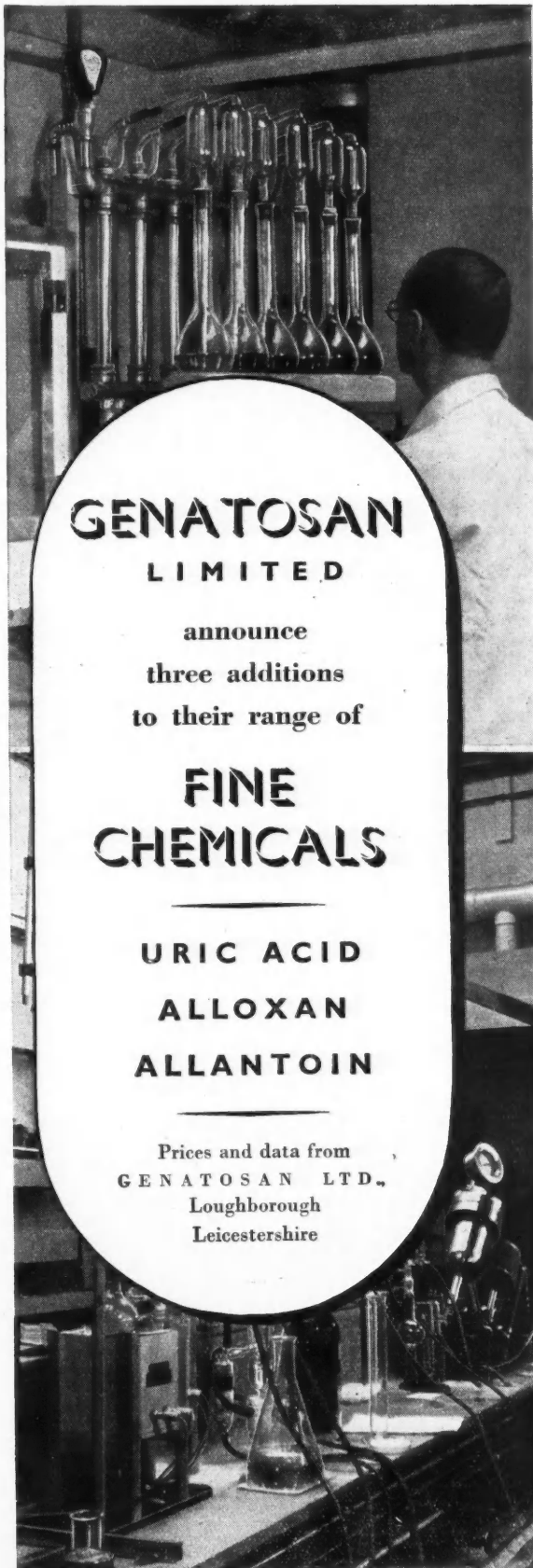
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Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CLIFFORD CHEMICAL CO., LTD., Hounslow. (M., 5/10/40.) Sept. 9, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge.

O. H. BELL, LTD., Wembley, oil and paint manufacturers. (M., 5/10/40.) Sept. 11, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; general charge.

SOUTH WALES ALUMINIUM CO., LTD., London, E.C. (M., 5/10/40.) Sept. 12, £200,000 first debenture to Solicitor H.M. Treasury; general charge. *Nil. July 19, 1940.

Satisfactions

MAJOR AND CO., LTD., London, W.C., chemical manufacturers. (M.S., 5/10/40.) Satisfaction Sept. 20, of debenture registered March 8, 1924.

County Court Judgments

CURWEN-MILLER CO., LTD., R/O, 40 Newfoundland Street, Bristol, paint manufacturers. (C.C.J., 5/10/40.) £15 8s. 4d. August 15.

FULLER SIMPSON, LTD., 323 City Road, E.C.1, manufacturing chemists. (C.C.J., 5/10/40.) £17 0s. 8d. July 18.

Company News

British Xylonite, Ltd., have declared an interim dividend of 2½ per cent., less tax, on ordinary shares (last year the same).

Erinoid, Ltd., announce a dividend on ordinary stock of 6 per cent., less tax, out of the profits to July 31 (last year, nil). Meeting on October 30.

Ward Blenkinsop & Company, Ltd., chemists, etc., "Brooklands," Halewood, near Liverpool, have increased their nominal capital by the addition of £10,000, in £1 ordinary shares, beyond the registered capital of £50,000.

Smith Bros. & Co. (Oil Distillers), Ltd., 21 Marshgate Lane, E.15, have increased their nominal capital by the addition of £10,000, in £1 ordinary shares, beyond the registered capital of £40,000.

Chemical Trade Inquiries

Argentina.—An agent established at Buenos Aires wishes to obtain the representation of United Kingdom manufacturers of industrial chemicals. (Ref. No. 496.)

South Africa.—H.M. Trade Commissioner at Johannesburg reports that the South African Railways and Harbours Administration is calling for tenders (Tender No. 2883) for the supply and delivery of approximately 9,550 gallons turpentine and 26,600 gallons white spirit—type 1, to B.S.S. No. 244—1936—required during the period January 1, 1941, to December 31, 1941. Tenders endorsed "Tender No. 2883 Turpentine and White Spirit" should be addressed to Chief Stores Superintendent, Purchase Section, Room 3, Park Chambers, Rissik Street, or P.O. Box 8617, Johannesburg, by whom they will be received up to 3 p.m. on October 18, 1940. A copy of the schedule and general conditions of tender is available for loan on application to the Department of Overseas Trade. Local representation is essential.

New Companies Registered

Dufalite, Ltd. (363,354).—Private company. Capital, £100 in 100 shares of £1 each. To adopt an agreement with Dufay-Chromex, Ltd., and to carry on the business of general merchants, manufacturers, processors, exporters and importers of fibres, fabrics, film and glass and similar transparent substances and substitutes therefor, etc. Subscribers: Herbert L. Hyneman, Elizabeth Beaven. Secretary (pro tem): Elizabeth J. Beaven. Solicitors: Adler and Perowine, 46/7 London Wall, E.C. Registered office: 112/3, Fenchurch Street, E.C.

Ekroy Products (1940), Ltd. (363,413).—Private company. Capital, £1,000 in 900 ordinary and 100 7½ per cent. cumulative preference shares of £1 each. To acquire the business of manufacturing and wholesale chemists and general merchants now carried on by Ekroy Products, Ltd., at Brackley Street, Swinton, Lancs. Directors: Alfred C. Yorke, Marjorie J. Yorke, Ernest R. Sewell. Registered office: Brackley Street, Swinton, near Manchester.

Vermkil Company, Ltd. (363,351).—Private company. Capital, £500 in 160 10 per cent. cum. pref. and 340 ordinary shares of £1 each. To acquire the benefit of certain inventions relating to the treatment of chemicals and the production of chemical compounds, and to carry on the business of manufacturers of and dealers in vermicides, insecticides, germicides, fungicides and fumigating and disinfecting preparations, vermin destructors, etc. Permanent directors: Robert Kemp, Canada House, High Street, Southampton; Norman Clegg.

Chemical and Allied Stocks and Shares

UNDER the lead of British Government stocks, which lost part of their recent strength, somewhat easier conditions have developed in most sections of the Stock Exchange, where sentiment was governed by the very small volume of business again in evidence. Nevertheless, shares of chemical and allied companies were fairly steady, and in some directions price movements were in favour of holders.

Imperial Chemical attracted a fair amount of attention on general recognition of the market view that the dividend may be kept on an 8 per cent. basis, and made the higher price of 26s. 6d., while the preference units were around 28s. B. Laporte remained at close on 50s. awaiting declaration of the dividend, while William Blythe 3s. shares remained under the influence of the maintained interim payment, and were quoted at 5s. 3d. Greiff-Chemicals Holdings were again 5s. British Glues 4s. shares were also around 5s., and business in the 8 per cent. participating preference shares took place at 25s. 3d. Borax Consolidated deferred remained at 25s. 7½d. and Fison Packard were again 27s. 6d., while Cooper McDougall & Robertson kept at slightly over 20s. Burt, Boulton were 10s. awaiting publication of the financial results, due shortly.

In other directions, Tube Investments were firmer at 80s. 7½d.; the final dividend may be declared before the end of the month. Richard Thomas preference were easier at 8s. 3d. on the further postponement of a dividend payment. United Steel were steady at 17s., and Dorman Long better at 17s. 4½d., while Staveley improved to 39s., and Stewarts and Lloyds were 36s. 9d. Guest Keen, however, had an easier appearance at 20s., but Babcock and Wilcox firmed up to 32s. 6d. in advance of the interim dividend announcement. Barry and Staines were firmer at 22s. 9d.; this company's interim distribution should be declared shortly. Michael Nairn and Greenwich improved 1s. 3d. to 38s. 9d. Cement and allied companies' shares remained firm with Associated 57s. 6d. and Tunnel Cement 30s. British Plaster Board were higher at 11s. 6d. British Oxygen at 57s. 6d. and Turner and Newall at 56s. 3d. were relatively steady. Imperial Smelting were better at 9s. 9d. and Amalgamated Metal Corporation shares changed hands up to 14s. 9d. General Refractories had a firmer appearance at 6s. 3d.

Although "ex" the interim dividend, International Paint remained at 65s., but elsewhere, Pinchin Johnson were easier. Courtaulds at 28s. 6d. were little changed, and only small movements were shown in British Celanese ordinary and preference, and there were few changes in other textile securities, including Calico Printers and British Cotton and Wool Dyers. Murex shares were firm at 68s. 9d., following the maintenance of the dividend, while Lever and Unilever at 20s. 9d. and Distillers ordinary units at 56s. were other steady features. Allied Ironfounders improved a few pence to 11s. 3d. Triplex Glass were dull around 15s. United Glass Bottle were inactive and remained at 45s., and little business was reported in Canning Town Glass 5s. shares, which were quoted at 4s. 6d. Morgan Crucible first preference units transferred at 20s. at one time, and Monsanto Chemicals 5½ per cent. preference were again 21s. 3d.

Elsewhere, Beechams Pills deferred shares remained under the influence of the larger interim dividend, and were higher at 8s. 3d., while Griffiths Hughes were 7s. and Sangers 18s. Timothy Whites were 17s.; the interim dividend is due to be declared shortly. Boots Drug had a fairly steady appearance around 38s. 6d. British Drug Houses shares remained at 20s., while Cerebos kept at £7½, awaiting the interim payment, which it is generally expected will be unchanged. On the other hand, British Match were lower at 27s. 9d., but United Molasses were 19s., and Wall Paper Manufacturers deferred were unchanged at 14s. 4½d. Despite satisfaction with the Burnah Oil interim payment, the tendency in oil shares was moderately reactionary.

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